THAT WHICH IS CLAIMED:

1. A thioester polymer derivative, comprising a water soluble and non-peptidic polymer backbone having at least one terminus bonded to the structure:

$$L-(Z)_a-(CH)_m-\overset{X}{\underset{|}{C}}-\overset{O}{\underset{||}{C}}-S-Q$$

wherein,

L is the point of bonding to the polymer backbone,

Z is selected from the group consisting of -O-, -S-, -NHCO-, -CONH-, -O_2C-, -$NHCO_2$-, and -O_2CNH-,

m is from 0 to about 12,

each X is independently selected from H and alkyl,

a is 0 or 1, and

Q is a leaving group.

2. The polymer derivative of Claim 1, wherein the polymer backbone is selected from the group consisting of poly(alkylene glycol), poly(oxyethylated polyol), poly(olefinic alcohol), poly(vinylpyrrolidone), poly(α-hydroxy acid), poly(vinyl alcohol), polyphosphazene, polyoxazoline, poly(N-acryloylmorpholine), polyacrylate, polyacrylamides, polysaccharides, and copolymers, terpolymers, and mixtures thereof.
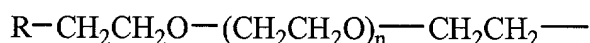

3. The polymer derivative of Claim 1, wherein said water soluble and non-peptidic polymer backbone is selected from the group consisting of poly(ethylene glycol), poly(propylene glycol), and copolymers of ethylene glycol and propylene glycol.

4. The polymer derivative of Claim 1, wherein the polymer backbone is poly(ethylene glycol).

5. The polymer derivative of Claim 4, wherein the poly(ethylene glycol) has an average molecular weight from about 800 Da to about 100,000 Da.

6. The polymer derivative of Claim 1, wherein the polymer backbone has about 2 to about 300 termini.

7. The polymer derivative of Claim 1, wherein the polymer backbone has the structure

$$R-CH_2CH_2O-(CH_2CH_2O)_{\overline{n}}-CH_2CH_2-$$

wherein R is a capping group and n is about 2 to about 4000.

8. The polymer derivative of Claim 7, wherein R is selected from the group consisting of alkoxy, alkyl, benzyl, aryl, aryloxy, hydroxyl, protected hydroxyl, active ester, active carbonate, acetal, aldehyde, aldehyde hydrates, alkenyl, acrylate, methacrylate, acrylamide, active sulfone, amine, protected amine, hydrazide, protected hydrazide, thiol, protected thiol, carboxylic acid, protected carboxylic acid, isocyanate, isothiocyanate, maleimide, vinylsulfone, dithiopyridine, vinylpyridine, iodoacetamide, epoxide, glyoxals, diones, mesylates, tosylates, tresylate or $-(Z)_a-(CXH)_m-CO-S-Q$, wherein Z, X, m, a and Q are as defined above.

9. The polymer derivative of Claim 1, wherein the polymer backbone has the structure

$$R-\underset{\underset{X'}{|}}{C}HCH_2-(O\underset{\underset{X'}{|}}{C}HCH_2)_n-O\underset{\underset{X'}{|}}{C}HCH_2-$$

wherein R is a capping group, each X' is independently H or alkyl, and n is about 2 to about 4000.

10. The polymer derivative of Claim 9, wherein R is selected from the group consisting of alkoxy, alkyl, benzyl, aryl, aryloxy, hydroxyl, protected hydroxyl, active ester, active carbonate, acetal, aldehyde, aldehyde hydrates, alkenyl, acrylate, methacrylate, acrylamide, active sulfone, amine, protected amine, hydrazide, protected hydrazide, thiol, protected thiol, carboxylic acid, protected carboxylic acid, isocyanate, isothiocyanate, maleimide, vinylsulfone, dithiopyridine, vinylpyridine, iodoacetamide, epoxide, glyoxals, diones, mesylates, tosylates, tresylate or $-(Z)_a-(CXH)_m-CO-S-Q$,
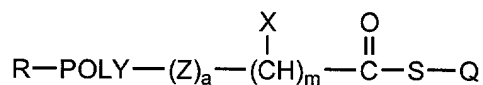
wherein Z, X, m, a and Q are as defined above.

11. The polymer derivative of Claim 1, wherein Q is selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, phenol, nitrophenol, benzoic acid, pyridine, pyridinecarboxylic acid and nitropyridine.

12. The polymer derivative of Claim 1, wherein Q is pyridine.

13. The polymer derivative of Claim 1, wherein a is 1 and Z is O.

14. The polymer derivative of Claim 1, wherein m is 1 to about 4.

15. The polymer derivative of Claim 1, having the structure:

$$R\!-\!POLY\!-\!(Z)_a\!-\!(CH)_m\!\overset{\overset{\displaystyle X}{\displaystyle |}}{}\!-\!\overset{\overset{\displaystyle O}{\displaystyle \|}}{C}\!-\!S\!-\!Q$$

wherein POLY is a water soluble and non-peptidic polymer backbone, R is a capping group, and Z, X, m, a and Q are as defined above.

16. The polymer derivative of Claim 15, wherein R is selected from the group consisting of alkoxy, alkyl, benzyl, aryl, aryloxy, hydroxyl, protected hydroxyl, active ester, active carbonate, acetal, aldehyde, aldehyde hydrates, alkenyl, acrylate, methacrylate, acrylamide, active sulfone, amine, protected amine, hydrazide, protected hydrazide, thiol, protected thiol, carboxylic acid, protected carboxylic acid, isocyanate, isothiocyanate, maleimide, vinylsulfone, dithiopyridine, vinylpyridine, iodoacetamide, epoxide, glyoxals, diones, mesylates, tosylates, tresylate or $-(Z)_a\text{-}(CXH)_m\text{-}CO\text{-}S\text{-}Q$, wherein Z, X, m, a and Q are as defined above.

17. The polymer derivative of Claim 15, wherein POLY is selected from the group consisting of poly(alkylene glycol), poly(oxyethylated polyol), poly(olefinic alcohol), poly(vinylpyrrolidone), poly(α-hydroxy acid), poly(vinyl alcohol),

polyphosphazene, polyoxazoline, poly(N-acryloylmorpholine), polyacrylate, polyacrylamides, polysaccharides, and copolymers, terpolymers, and mixtures thereof.

18. The polymer derivative of Claim 15, wherein POLY is selected from the group consisting of poly(ethylene glycol), poly(propylene glycol), and copolymers of ethylene glycol and propylene glycol.

19. The polymer derivative of Claim 15, wherein POLY is poly(ethylene glycol).

20. The polymer derivative of Claim 15, wherein Q is selected from the group consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, phenol, nitrophenol, benzoic acid, pyridine, pyridinecarboxylic acid and nitropyridine.
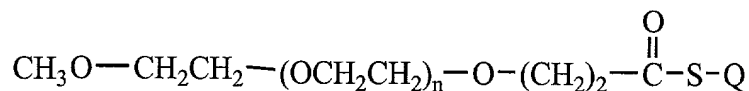
21. The polymer derivative of Claim 15, wherein Q is pyridine.

22. The polymer derivative of Claim 15, wherein a is 1 and Z is O.

23. The polymer derivative of Claim 15, wherein m is 1 to about 4.

24. The polymer derivative of Claim 15, wherein a and m are 0.

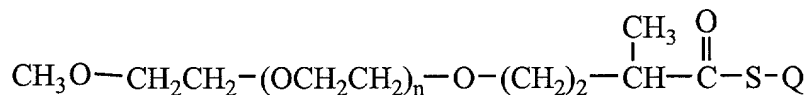25. The polymer derivative of Claim 1, having the structure:

$$CH_3O-CH_2CH_2-(OCH_2CH_2)_n-O-(CH_2)_2-\overset{\displaystyle O}{\overset{\displaystyle \|}{C}}-S-Q$$

wherein Q is as defined above and n is from about 2 to about 4000.

26. The polymer derivative of Claim 1, having the structure:

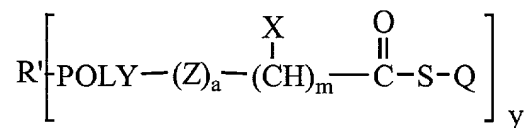$$CH_3O-CH_2CH_2-(OCH_2CH_2)_n-O-CH_2-\overset{\displaystyle O}{\overset{\displaystyle \|}{C}}-S-Q$$

wherein Q is as defined above and n is from about 2 to about 4000.

27. The polymer derivative of Claim 1, having the structure:

$$CH_3O-CH_2CH_2-(OCH_2CH_2)_n-O-(CH_2)_2-\overset{\overset{CH_3}{|}}{CH}-\overset{\overset{O}{\|}}{C}-S-Q$$

wherein Q is as defined above and n is from about 2 to about 4000.

28. The polymer derivative of Claim 1, having the structure:

$$R'\left[POLY-(Z)_a-\overset{\overset{X}{|}}{(CH)_m}-\overset{\overset{O}{\|}}{C}-S-Q\right]_y$$

wherein each POLY is a water soluble and non-peptidic polymer backbone, R' is a non-dendritic central core molecule, y is from about 3 to about 100, and Z, X, m, a and Q are as defined above.

29. The polymer derivative of Claim 28, wherein POLY is selected from the group consisting of poly(alkylene glycol), poly(oxyethylated polyol), poly(olefinic alcohol), poly(vinylpyrrolidone), poly(α-hydroxy acid), poly(vinyl alcohol), polyphosphazene, polyoxazoline, poly(N-acryloylmorpholine), polyacrylate, polyacrylamides, polysaccharides, and copolymers, terpolymers, and mixtures thereof
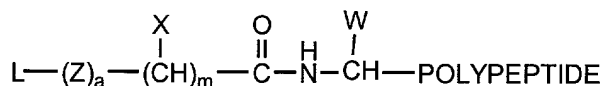
30. The polymer derivative of Claim 28, wherein POLY is poly(ethylene glycol).

31. The polymer derivative of Claim 28, wherein R' is derived from a molecule selected from the group consisting of polyols, polyamines, and molecules having a combination of alcohol and amine groups.

32. The polymer derivative of Claim 28, wherein R' is derived from a molecule

selected from the group consisting of glycerol, glycerol oligomers, pentaerythritol, sorbitol, and lysine.

33. A polymer conjugate of a polypeptide having a cysteine or histidine molecule at the N-terminus, said polymer conjugate comprising a water soluble and non-peptidic polymer backbone having at least one terminus bonded to the structure:
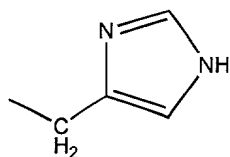
$$L-(Z)_a-(CH)_m-\overset{\overset{\displaystyle X}{|}}{C}-\overset{\overset{\displaystyle O}{||}}{} -\overset{\overset{\displaystyle H}{N}}{}-\overset{\overset{\displaystyle W}{|}}{CH}-POLYPEPTIDE$$

wherein

L is the point of bonding to the polymer backbone,

Z is selected from the group consisting of -O-, -S-, -NHCO-, -CONH-, -O$_2$C-, -NHCO$_2$-, and -O$_2$CNH-,

m is from 0 to about 12,

each X is independently selected from H and alkyl,

a is 0 or 1,

W is -CH$_2$SH or [imidazole structure with C H$_2$] , and

POLYPEPTIDE is the residue of the polypeptide molecule.

34. The polymer conjugate of Claim 33, wherein the polymer backbone is selected from the group consisting of poly(alkylene glycol), poly(oxyethylated polyol), poly(olefinic alcohol), poly(vinylpyrrolidone), poly(α-hydroxy acid), poly(vinyl alcohol), polyphosphazene, polyoxazoline, poly(N-acryloylmorpholine), polyacrylate, polyacrylamides, polysaccharides, and copolymers, terpolymers, and mixtures thereof.

35. The polymer conjugate of Claim 33, wherein the polymer backbone is selected from the group consisting of poly(ethylene glycol), poly(propylene glycol), and copolymers of ethylene glycol and propylene glycol.

36. The polymer conjugate of Claim 33, wherein the polymer backbone is poly(ethylene glycol).

37. The polymer conjugate of Claim 36, wherein the poly(ethylene glycol) has an average molecular weight from about 800 Da to about 100,000 Da.

38. The polymer conjugate of Claim 33, wherein a is 1 and Z is O.

39. The polymer conjugate of Claim 33, wherein m is 1 to about 4.

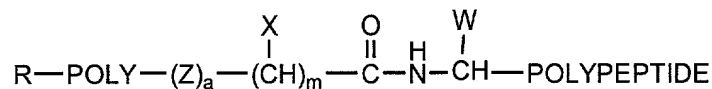40. The polymer conjugate of Claim 33, wherein a and m are 0.

41. The polymer conjugate of Claim 33, wherein POLYPEPTIDE is selected from the group consisting of protein ligands, enzymes, cytokines, hematopoietins, growth factors, hormones, antigens, antibodies, antibody fragments, receptors, and protein fragments.

42. The polymer conjugate of Claim 33, wherein POLYPEPTIDE is selected from the group consisting of calcitonin, parathyroid hormone, interferon alpha, interferon beta, interferon gamma, interleukins 1-21, granulocyte-colony stimulating factor, macrophage-colony stimulating factor, granulocyte-macrophage colony stimulating factor, stem cell factor, leukemia inhibitory factor, kit-ligand, flt-3 ligand, erythropoietin, thrombopoietin, tumor necrosis factor alpha, tumor necrosis factor beta, transforming growth factor, bone morphogenic proteins, osteoprotegerin, tissue plasminogen activator, platelet derived growth factor, fibroblast growth factor, keratinocyte growth factor, epidermal growth factor, human growth hormone, insulin, TRAIL, DNAse, receptors, enzymes, fusion proteins, chimeric antibodies, humanized antibodies, fully human antibodies, Fab fragments, F(ab')$_2$ fragments, Fv fragments, and scFv fragments.

43. The polymer conjugate of Claim 33, wherein POLYPEPTIDE is an interferon

molecule.

44. The polymer conjugate of Claim 33, having the structure:

$$R-POLY-(Z)_a-(CH)_m \overset{X}{\underset{|}{}} -\overset{O}{\underset{||}{C}}-\overset{H}{\underset{N}{}}-\overset{W}{\underset{|}{CH}}-POLYPEPTIDE$$

wherein

R is a capping group,
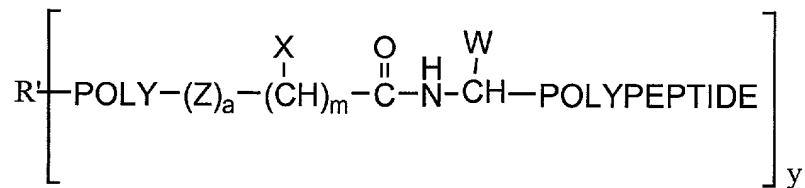
POLY is a water soluble and non-peptidic polymer backbone,

And Z, a, X, m, W and POLYPEPTIDE are as defined above.

45. The polymer conjugate of Claim 44, wherein R is selected from the group consisting of alkoxy, alkyl, benzyl, aryl, aryloxy, hydroxyl, protected hydroxyl, active ester, active carbonate, acetal, aldehyde, aldehyde hydrates, alkenyl, acrylate, methacrylate, acrylamide, active sulfone, amine, protected amine, hydrazide, protected hydrazide, thiol, protected thiol, carboxylic acid, protected carboxylic acid, isocyanate, isothiocyanate, maleimide, vinylsulfone, dithiopyridine, vinylpyridine, iodoacetamide, epoxide, glyoxals, diones, mesylates, tosylates, tresylate or $-(Z)_a-(CXH)_m-CO-NH-CWH-POLYPEPTIDE$, wherein Z, X, m, a, W and POLYPEPTIDE are as defined above.

46. The polymer conjugate of Claim 44, wherein R is methoxy, POLY is poly(ethylene glycol), a is 1, Z is O, m is 1 to about 3, and each X is H or CH_3.

47. The polymer conjugate of Claim 33, having the structure:

$$\left[R'-POLY-(Z)_a-(CH)_m \overset{X}{\underset{|}{}} -\overset{O}{\underset{||}{C}}-\overset{H}{\underset{N}{}}-\overset{W}{\underset{|}{CH}}-POLYPEPTIDE \right]_y$$

wherein

R' is a non-dendritic central core molecule,

y is from about 3 to about 100,

POLY is a water soluble and non-peptidic polymer backbone,

And Z, a, X, m, W and POLYPEPTIDE are as defined above.

48. The polymer conjugate of Claim 47, wherein POLY is selected from the group consisting of poly(alkylene glycol), poly(oxyethylated polyol), poly(olefinic alcohol), poly(vinylpyrrolidone), poly(α-hydroxy acid), poly(vinyl alcohol), polyphosphazene, polyoxazoline, poly(N-acryloylmorpholine), polyacrylate, polyacrylamides, polysaccharides, and copolymers, terpolymers, and mixtures thereof.

49. The polymer conjugate of Claim 47, wherein POLY is selected from the group consisting of poly(ethylene glycol), poly(propylene glycol), and copolymers of ethylene glycol and propylene glycol.

50. The polymer conjugate of Claim 47, wherein POLY is poly(ethylene glycol).

51. The polymer conjugate of Claim 50, wherein the poly(ethylene glycol) has an average molecular weight from about 800 Da to about 100,000 Da.

52. The polymer conjugate of Claim 47, wherein POLY is poly(ethylene glycol), a is 1, Z is O, m is 1 to about 3, and each X is H or CH_3.

53. The polymer conjugate of Claim 47, wherein R' is derived from a molecule selected from the group consisting of polyols, polyamines, and molecules having a combination of alcohol and amine groups.

54. The polymer conjugate of Claim 47, wherein R' is derived from a molecule selected from the group consisting of glycerol, glycerol oligomers, pentaerythritol, sorbitol, and lysine.

55. A method of conjugating a polymer derivative to a polypeptide having a cysteine or histidine molecule at the N-terminus, said method comprising:

  providing a polypeptide having a cysteine or histidine molecule at the N-terminus;

  providing a thioester polymer derivative, the polymer derivative comprising a water soluble and non-peptidic polymer backbone having at least one terminus bonded to the structure:

$$L-(Z)_a-(CH)_m-\overset{X}{\underset{}{|}}\;\overset{O}{\underset{}{\|}}C-S-Q$$
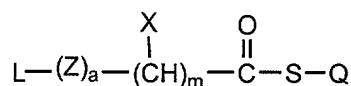
wherein

L is the point of bonding to the polymer backbone,

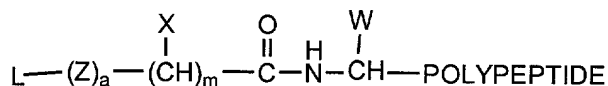Z is selected from the group consisting of -O-, -S-, -NHCO-, -CONH-, -O$_2$C-, -NHCO$_2$-, and -O$_2$CNH-,

m is from 0 to about 12,

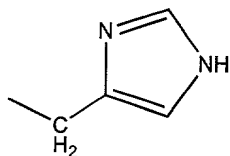each X is independently selected from H and alkyl,

a is 0 or 1, and

Q is a leaving group;

  reacting the thioester polymer derivative with the polypeptide to form a conjugate having the structure:

$$L-(Z)_a-(CH)_m-\overset{X}{\underset{}{|}}\;\overset{O}{\underset{}{\|}}C-\overset{H}{\underset{}{N}}-\overset{W}{\underset{}{|}}CH-POLYPEPTIDE$$

wherein

POLYPEPTIDE is the residue of the polypeptide molecule, and

W is -CH$_2$SH or

56. The method of Claim 55, wherein the polymer backbone is selected from the group consisting of poly(alkylene glycol), poly(oxyethylated polyol), poly(olefinic alcohol), poly(vinylpyrrolidone), poly(α-hydroxy acid), poly(vinyl alcohol), polyphosphazene, polyoxazoline, poly(N-acryloylmorpholine), polyacrylate, polyacrylamides, polysaccharides, and copolymers, terpolymers, and mixtures thereof.

57. The method of Claim 55, wherein said water soluble and non-peptidic polymer backbone is selected from the group consisting of poly(ethylene glycol), poly(propylene glycol), and copolymers of ethylene glycol and propylene glycol.

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58. The method of Claim 55, wherein the polymer backbone is poly(ethylene glycol).

59. The method of Claim 58, wherein the poly(ethylene glycol) has an average

10   molecular weight from about 800 Da to about 100,000 Da.

60. The method of Claim 55, wherein the polymer backbone has about 2 to about 300 termini.

15   61. The method of Claim 55, wherein a is 1 and Z is O.

62. The method of Claim 55, wherein m is 1 to about 4.

63. The method of Claim 55, wherein POLYPEPTIDE is selected from the group

20   consisting of protein ligands, enzymes, cytokines, hematopoietins, growth factors, hormones, antigens, antibodies, antibody fragments, receptors, and protein fragments.

64. The method of Claim 55, wherein POLYPEPTIDE is selected from the group consisting of calcitonin, parathyroid hormone, interferon alpha, interferon beta, interferon

25   gamma, interleukins 1-21, granulocyte-colony stimulating factor, macrophage-colony stimulating factor, granulocyte-macrophage colony stimulating factor, stem cell factor, leukemia inhibitory factor, kit-ligand, flt-3 ligand, erythropoietin, thrombopoietin, tumor necrosis factor alpha, tumor necrosis factor beta, transforming growth factor, bone morphogenic proteins, osteoprotegerin, tissue plasminogen activator, platelet derived

30   growth factor, fibroblast growth factor, keratinocyte growth factor, epidermal growth factor, human growth hormone, insulin, TRAIL, DNAse, receptors, enzymes, fusion
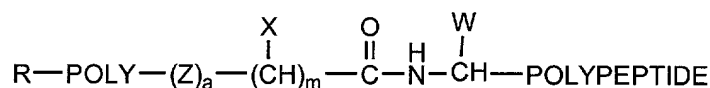
proteins, chimeric antibodies, humanized antibodies, fully human antibodies, Fab

fragments, F(ab')$_2$ fragments, Fv fragments, and scFv fragments.

65. The method of Claim 55, wherein POLYPEPTIDE is an interferon molecule.

66. The method of Claim 55, wherein the conjugate has the structure:

$$\underset{R\text{—}POLY\text{—}(Z)_a\text{—}(\overset{\overset{\displaystyle X}{\displaystyle |}}{C}H)_m\text{—}\overset{\overset{\displaystyle O}{\displaystyle \|}}{C}\text{—}\overset{\overset{\displaystyle H}{\displaystyle |}}{N}\text{—}\overset{\overset{\displaystyle W}{\displaystyle |}}{C}H\text{—}POLYPEPTIDE}{}$$

wherein

R is a capping group,

POLY is a water soluble and non-peptidic polymer backbone,

And Z, a, X, m, W and POLYPEPTIDE are as defined above.
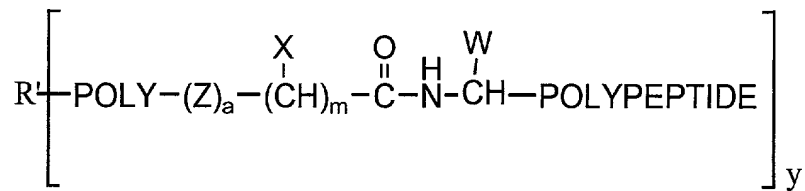

67. The method of Claim 66, wherein R is selected from the group consisting of

alkoxy, alkyl, benzyl, aryl, aryloxy, hydroxyl, protected hydroxyl, active ester, active

carbonate, acetal, aldehyde, aldehyde hydrates, alkenyl, acrylate, methacrylate,

acrylamide, active sulfone, amine, protected amine, hydrazide, protected hydrazide, thiol,

protected thiol, carboxylic acid, protected carboxylic acid, isocyanate, isothiocyanate,

maleimide, vinylsulfone, dithiopyridine, vinylpyridine, iodoacetamide, epoxide, glyoxals,

diones, mesylates, tosylates, tresylate or $-(Z)_a-(CXH)_m-CO-NH-CWH-POLYPEPTIDE$,

wherein Z, X, m, a, W and POLYPEPTIDE are as defined above.

68. The method of Claim 66, wherein R is methoxy, POLY is poly(ethylene

glycol), a is 1, Z is O, m is 1 to about 3, and each X is H or CH_3.

69. The method of Claim 55, having the structure:

$$R'\left[-POLY-(Z)_a-(CH)_m-\overset{\overset{\displaystyle X}{|}}{C}-\overset{\overset{\displaystyle O}{\|}}{\underset{\underset{\displaystyle H}{|}}{N}}-\overset{\overset{\displaystyle W}{|}}{CH}-POLYPEPTIDE\right]_y$$

wherein

R' is a non-dendritic central core molecule,

y is from about 3 to about 100,

POLY is a water soluble and non-peptidic polymer backbone,

And Z, a, X, m, W and POLYPEPTIDE are as defined above.

70. The method of Claim 69, wherein POLY is selected from the group consisting of poly(alkylene glycol), poly(oxyethylated polyol), poly(olefinic alcohol), poly(vinylpyrrolidone), poly(α-hydroxy acid), poly(vinyl alcohol), polyphosphazene, polyoxazoline, poly(N-acryloylmorpholine), polyacrylate, polyacrylamides, polysaccharides, and copolymers, terpolymers, and mixtures thereof.

71. The method of Claim 69, wherein POLY is poly(ethylene glycol).

72. The method of Claim 69, wherein POLY is poly(ethylene glycol), a is 1, Z is O, and m is 1 to about 3.

73. The method of Claim 69, wherein R' is derived from a molecule selected from the group consisting of polyols, polyamines, and molecules having a combination of alcohol and amine groups.

74. The method of Claim 69, wherein R' is derived from a molecule selected from the group consisting of glycerol, glycerol oligomers, pentaerythritol, sorbitol, and lysine.


75. The method of Claim 55, wherein the polypeptide has a cysteine molecule at

the N-terminus, further comprising the step of reacting a thiol-reactive polymer derivative with the free thiol group of the N-terminal cysteine molecule.

76. A polymer conjugate of a molecule having a terminal $-CH(W)-NH_2$, wherein
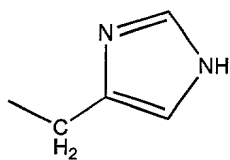
W is $-CH_2SH$ or

, said polymer conjugate comprising a water soluble and non-peptidic polymer backbone having at least one terminus bonded to the structure:

$$L-(Z)_a-(CH)_m-\overset{O}{\underset{\parallel}{C}}-\overset{H}{\underset{}{N}}-\overset{W}{\underset{}{CH}}-$$
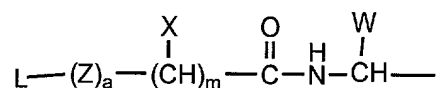
wherein.

L is the point of bonding to the polymer backbone,

Z is selected from the group consisting of -O-, -S-, -NHCO-, -CONH-, -O$_2$C-, -NHCO$_2$-, and -O$_2$CNH-,

m is from 0 to about 12,

each X is independently selected from H and alkyl, and

a is 0 or 1.

77. The polymer conjugate of Claim 76, wherein the polymer backbone is selected from the group consisting of poly(alkylene glycol), poly(oxyethylated polyol), poly(olefinic alcohol), poly(vinylpyrrolidone), poly(α-hydroxy acid), poly(vinyl alcohol), polyphosphazene, polyoxazoline, poly(N-acryloylmorpholine), polyacrylate, polyacrylamides, polysaccharides, and copolymers, terpolymers, and mixtures thereof.

78. The polymer conjugate of Claim 76, wherein the polymer backbone is selected from the group consisting of poly(ethylene glycol), poly(propylene glycol), and copolymers of ethylene glycol and propylene glycol.

79. The polymer conjugate of Claim 76, wherein the polymer backbone is poly(ethylene glycol).
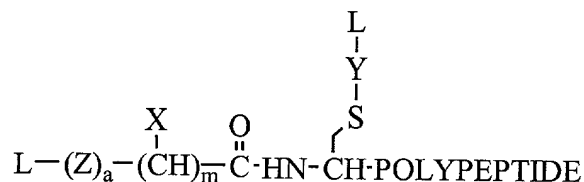
80. The polymer conjugate of Claim 79, wherein the poly(ethylene glycol) has an average molecular weight from about 800 Da to about 100,000 Da.

81. The polymer conjugate of Claim 76, wherein a is 1 and Z is O.

82. The polymer conjugate of Claim 76, wherein m is 1 to about 4.

83. The polymer conjugate of Claim 76, wherein a and m are 0.

84. A polymer conjugate of a polypeptide having a cysteine molecule at the N-terminus, said polymer conjugate comprising at least two water soluble and non-peptidic polymer backbones bonded to the structure:

$$\begin{array}{c} \text{L} \\ | \\ \text{Y} \\ | \\ \text{X} \quad \text{O} \quad \text{S} \\ | \quad \| \quad | \\ \text{L}-(\text{Z})_a-(\text{CH})_{\overline{m}}\,\text{C-HN-CH-POLYPEPTIDE} \end{array}$$

wherein

L is the point of bonding to each of said at least two polymer backbones,

Y is a linker,

Z is selected from the group consisting of -O-, -S-, -NHCO-, -CONH-, -O$_2$C-, -NHCO$_2$-, and -O$_2$CNH-,

m is from 0 to about 12,

each X is independently selected from H and alkyl,

a is 0 or 1, and

POLYPEPTIDE is the residue of the polypeptide molecule.

85. The polymer conjugate of Claim 84, wherein each polymer backbone is selected from the group consisting of poly(alkylene glycol), poly(oxyethylated polyol), poly(olefinic alcohol), poly(vinylpyrrolidone), poly(α-hydroxy acid), poly(vinyl alcohol),

polyphosphazene, polyoxazoline, poly(N-acryloylmorpholine), polyacrylate, polyacrylamides, polysaccharides, and copolymers, terpolymers, and mixtures thereof.

86. The polymer conjugate of Claim 84, wherein each polymer backbone is selected from the group consisting of poly(ethylene glycol), poly(propylene glycol), and copolymers of ethylene glycol and propylene glycol.

87. The polymer conjugate of Claim 84, wherein each polymer backbone is poly(ethylene glycol).

88. The polymer conjugate of Claim 87, wherein the poly(ethylene glycol) has an average molecular weight from about 800 Da to about 100,000 Da.

89. The polymer conjugate of Claim 84, wherein a is 1 and Z is O.

90. The polymer conjugate of Claim 84, wherein m is 1 to about 4.

91. The polymer conjugate of Claim 84, wherein a and m are 0.

92. The polymer conjugate of Claim 84, wherein POLYPEPTIDE is selected from the group consisting of protein ligands, enzymes, cytokines, hematopoietins, growth factors, hormones, antigens, antibodies, antibody fragments, receptors, and protein fragments.
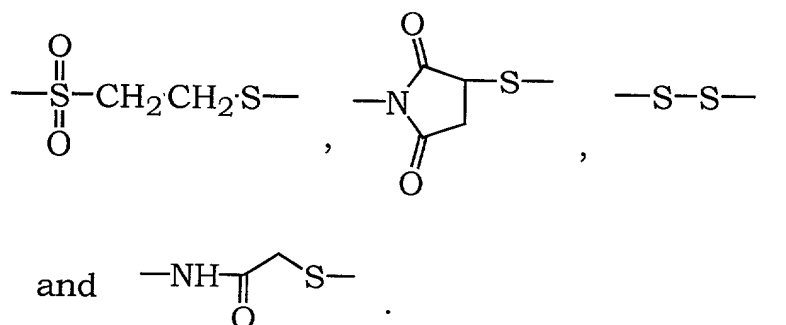
93. The polymer conjugate of Claim 84, wherein POLYPEPTIDE is selected from the group consisting of calcitonin, parathyroid hormone, interferon alpha, interferon beta, interferon gamma, interleukins 1-21, granulocyte-colony stimulating factor, macrophage-colony stimulating factor, granulocyte-macrophage colony stimulating factor, stem cell factor, leukemia inhibitory factor, kit-ligand, flt-3 ligand, erythropoietin, thrombopoietin, tumor necrosis factor alpha, tumor necrosis factor beta, transforming growth factor, bone morphogenic proteins, osteoprotegerin, tissue

plasminogen activator, platelet derived growth factor, fibroblast growth factor, keratinocyte growth factor, epidermal growth factor, human growth hormone, insulin, TRAIL, DNAse, receptors, enzymes, fusion proteins, chimeric antibodies, humanized antibodies, fully human antibodies, Fab fragments, F(ab')$_2$ fragments, Fv fragments, and
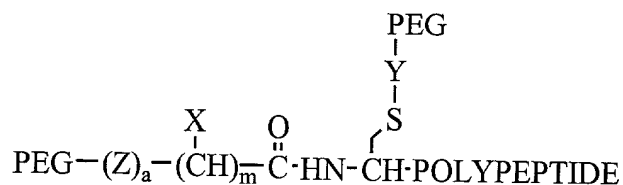
5   scFv fragments.

94. The polymer conjugate of Claim 84, wherein POLYPEPTIDE is an interferon molecule.

10   95. The polymer conjugate of Claim 84, wherein Y is selected from the group consisting of

$$-\overset{\overset{\displaystyle O}{\|}}{\underset{\underset{\displaystyle O}{\|}}{S}}-CH_2CH_2S- \qquad -N\overset{\overset{\displaystyle O}{}}{\underset{\underset{\displaystyle O}{}}{}}-S- \qquad -S-S- \qquad ,$$

and $-NH-\overset{}{\underset{\underset{\displaystyle O}{\|}}{C}}-S-$.

96. The polymer conjugate of Claim 84, wherein only two polymer backbones
15   are bonded to said structure.

97. The polymer conjugate of Claim 84, having the structure:

$$\begin{array}{c} PEG \\ | \\ Y \\ | \\ PEG-(Z)_a-(CH)_m^{\overset{X}{|}}\overset{O}{\overset{\|}{C}}-HN-\overset{S}{\overset{|}{CH}}-POLYPEPTIDE \end{array}$$

      wherein
20   Z, a, X, m, and POLYPEPTIDE are as defined above,
      PEG is poly(ethylene glycol), and

Y is selected from the group consisting of

$$-\overset{\overset{\displaystyle O}{\|}}{\underset{\underset{\displaystyle O}{\|}}{S}}-CH_2 \cdot CH_2 \cdot S- \quad , \qquad -N \overset{\overset{\displaystyle O}{\|}}{\underset{\underset{\displaystyle O}{\|}}{\diagdown}} S- \quad , \qquad -S-S- \quad ,$$

and $\quad -NH-\overset{}{\underset{\underset{\displaystyle O}{\|}}{C}}\diagup S- \quad .$